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# Structure of the Information Base and Operations on the Entities in a System for Information Servicing of Collectivities

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# STRUCTURE OF THE INFORMATON BASE AND OPERATIONS ON THE ENTITIES IN A SYSTEM FOR INFORMATION SERVICING OF COLLECTIVITIES\*

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The paper treats, from an user point of view, the structure of the entities in the information base (IB) of a System for information servicing of collectivities (SISC) as well as the operations on these entities.

**1. Values structure and operations on values.** Familiarity with the basic concepts of a SISC [1] is assumed in this presentation.

The data and the algorithms in the IB are represented by tables of two types (see Fig. 1). The following remarks supplement Fig. 1:

- neither the reduced language nor the temporary bases permit the use of compound tables;
- tables, the rows of which are not longer than the lines of the output units used, are split into pages;
- tables, the rows of which are longer than the lines of the output units used, are processed only row by row;
- in some cases the sequence numbers of the rows are used for their identification;

Entity	Explanation
<i>Item</i>	A number, a string, a table.
<i>Row</i>	A sequence of $n$ items ( $n \geq 1$ ), numbered from 1 to $n$ .
<i>Table</i>	A named sequence of $k$ rows ( $k \geq 1$ ), numbered from 1 to $k$ .
<i>Column of a table</i>	A named sequence of all table items (of number $k$ ) having the same position within each row. All items which belong to the same row are of the same type, they may differ only by their values, but not by their descriptions.
<i>First type table</i>	A table with non-varying number of rows. There exists a column, the items of which (numbers of strings, but not tables) are distinct from each other; these items do not vary and are used as names of the rows.
<i>Second type table</i>	A table with varying number of rows.
<i>Program</i>	A table, which can be executed by the SISC.
<i>Simple table</i>	A table of either type, the items of which are not tables.
<i>Compound table</i>	A table, which is not a simple table.

Fig. 1. Complete language — values structure

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- the maximum depth of inclusion of tables is two (in the example in Section 4 the depth of inclusion is exactly two);
- the user programs process data from the IB only by means of the SISC's linguistic tools;
- the tables (both simple and compound) may be normalized, in the sense of [2].

The basic operations on data values, included in the complete language are illustrated by Fig. 2. It must be added that:

- output of values is possible only for data items that are numbers or strings;
- tools for "turning pages" are used with the monitoring;
- setting up of a correspondence between the columns of both tables is possible in the intertable operations; whereby not necessarily all the columns participate in the operation; these operations can be used for restructuring of the tables.

The operations of the reduced language differ from those illustrated by Fig. 2 in the following:

- in the output the condition can contain not more than one condition-relation per column; this restriction permits positional specification of the conditions in an interactive mode;

Operations		Explanation
Intratable operations	output from the IB to the users  <i>monitoring query</i>  <i>complex query</i>	No conditions on the values are specified. Some conditions about the needed values are given. The search is nonsequential according to complicated conditions.
	input from the users to the IB  <i>initial entry of large batches</i> <i>updating</i>	Batches of rows are added to the existing rows in the table. The rows to be updated are determined according to specified conditions (as with queries). Some items (but not tables) are modified, some rows are added or deleted.
	exchange between the IB and the programs  <i>reading from the IB</i>  <i>writing into the IB</i>	Same as with queries, but the information is transferred into a work area of a program. Same as with updating.
Intertable operations	<i>transfer of rows</i>  <i>replacement of rows</i>	All rows of a table are added to the rows of another table with retention or deletion of all old rows. A condition is specified according to which some rows of a table are replaced by rows of another table.

Fig. 2 Complete language — a sample list of operations

- modification of not more than one row is permitted during updating;
- initial input of large quantities of data is possible in the temporary bases only;
- intertable operations are not used.

**2. Comments structure and operations on comments.** The comments are tables of second type with one column, the items of which are fixed length strings. The comments refer to a whole table. The need to receive comments for only a part of the table can be satisfied by describing in the beginning of the comments their contents (which pages of the comments contain common comments and which ones refer to a part of the table). The operations on comments are illustrated by Fig. 3.

The special operations offer possibilities for processing the comments by the most powerful tools of the system. With the help of these operations the comments can be converted into a table of values from a temporary base, after which it can be processed. The reverse is also possible — the values can be converted into comments.

The comments can be used for clarifying abbreviated names, for encoding of values, etc. Tools for monitoring the rights of access exist for both the comments and the values.

In the reduced language the comments are only a sequence of pages. The only operation is reading of a page of the comments.

**3. Descriptions structure and operations on descriptions.** Each description has a table structure. The structure of the descriptions is fixed in the system. Only the expert users have the right to enter descriptions.

The following operations can be performed on descriptions:

- input of a description by an user into the IB;
- output of a description from the IB to an user;
- exchange with programs — the description is transferred from the information base into the work area of an user program and vice versa;
- exchange of descriptions among entities of the IB;
- special operations — conversion of a description into a value and vice versa.

The special operations on the descriptions play the same role as the special operations on comments.

The reduced language does not permit the performance of any operations on descriptions.

Operations	Explanation
<i>Display</i>	The comments referring to a table, or a part of it, are made available to the user.
<i>Replacement</i>	The comments referring to a table are replaced by the comments of another table.
<i>Updating</i>	A whole row of comments is deleted or replaced. Initial batches of comments rows are entered.
<i>Special operations</i>	Conversion of comments into table values and of table values into comments.

Fig. 3. Operations on comments

**4. Example.** The following example of tables illustrates the data structures described in Section 1. The first type tables and the second type tables will be shortly denoted by *ft-tables* and *st-tables*, respectively.

The *st-tables* **STUDENTS** contains a *st-table* **STUDENTS-ROLL** and a *ft-table* **TIME-TABLE**. The *ft-table* **TIME-TABLE** contains a *st-table* **DAILY-PROGRAMME** and the *st-table* **STUDENTS-ROLL** contains *ft-table* **GRADES**. The depth of inclusion is two. The *ft-table* **TIME-TABLE** always contains 6 rows (the days from Monday to Saturday are recorded into the column **DAY**). Similarly the *ft-table* **GRADES** contains fixed number of rows; for each student the column **SUBJECT** contains the same set of subjects.

*st-table* **STUDENTS**

**GROUP TUTOR** *st-table* **STUDENTS-ROLL** *ft-table* **TIME-TABLE**

*st-table* **STUDENTS-ROLL**

**NUMBER NAME ADDRESS** *ft-table* **GRADES**

*ft-table* **TIME-TABLE**

**DAY** *st-table* **DAILY-PROGRAMME** **COMMENTS**

*ft-table* **GRADES**

**SUBJECT EXAMINATION-DATE GRADE**

*st-table* **DAILY-PROGRAMME**

**HOUR NUMBER-OF-GLASSES SUBJECT ROOM TEACHER**

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